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of observation and experiment, he advanced to general laws; and if BACON had never lived, the student of nature would have found in the writings and labors of GALILEO, not only the boasted principles of the inductive philosophy, but also their practical application to the highest efforts of invention and discovery." *

(To be continued.)

ELEMENTS AND EPHEMERIS OF COMET *e*, 1899) (GIACOBINI).†

BY MISS A. HOBE, Y. KUNO, S. C. PHIPPS, AND ROGER SPRAGUE.

From the first three Mt. Hamilton observations by PERRINE, kindly telegraphed to the Students' Observatory by Director KEELER, Miss HOBE, and Messrs. KUNO and PHIPPS, advanced students in the University, have computed the following elements and ephemeris of Comet *e*, 1899 (GIACOBINI):—

OBSERVATIONS.

1899 G. M. T.	α	δ
October 2.6758	$16^h\ 32^m\ 59^s.7$	$-4^\circ\ 12'\ 18''$
October 3.6378	16 34 22.1	−3 53 35
October 4.6292	16 35 46.7	−3 34 40

ELEMENTS.

$$T = 1899 \text{ July } 25.31196 \text{ G. M. T.}$$

$$\left.\begin{array}{rl} i = & 90^\circ\ 49'\ 58'' \\ \Omega = & 279\ \ 54\ \ 49 \\ \omega = & 327\ \ 26\ \ 20 \end{array}\right\} 1899.0$$

$$\log g = 0.128376$$

$$\text{O}-\text{C}:\ \Delta\lambda \cos\beta = -1''.5;\ \Delta\beta = -0''.1$$

CONSTANTS FOR THE EQUATOR OF 1899.

$$x = [9.365813_5] \sin(62^\circ\ 11'\ 36'' + v) \sec^2 \tfrac{1}{2} v$$

$$y = [0.123290] \sin(213\ \ 33\ \ 3 + v) \sec^2 \tfrac{1}{2} v$$

$$z = [0.126916] \sin(304\ \ 16\ \ 30 + v) \sec^2 \tfrac{1}{2} v$$

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* BREWSTER; "Martyrs of Science."

† Communicated by the Director of Students' Observatory, University of California.

EPHEMERIS.

1899 Gr. Mean Midnight.	app. α	app δ.	log Δ	Br.
October $8^d.5$	$16^h\ 41^m\ 13^s.9$	$-2^\circ\ 24'\ 8''$	0.3175	0.84
12 .5	46 45 .2	− 1 16 5	0.3340	
16 .5	52 11 .9	− 0 12 5	0.3495	
20 .5	57 34 .7	+ 0 48 34	0.3640	0.60

Brightness at the time of the first Mt. Hamilton observation is taken as unity.

Mr. ROGER SPRAGUE has independently computed the orbit from the same observations which he corrected for parallax and aberration on the basis of a first approximation.

ELEMENTS BY ROGER SPRAGUE.

$$T = 1899 \text{ July } 25.5208$$

$$\left.\begin{array}{l} i = 90^\circ\ \ 38'\ \ 22'' \\ \Omega = 279\ \ \ 47\ \ \ 0 \\ \omega = 327\ \ \ 53\ \ \ 50 \end{array}\right\} 1899.0$$

$$\log g = 0.130868$$

$$O - C: \Delta\lambda \cos\beta = -0''.8;\ \Delta\beta = +0''.3$$

UNIVERSITY OF CALIFORNIA, STUDENTS' OBSERVATORY.

PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1899.

BY MALCOLM MCNEILL.

Mercury is an evening star throughout the month, and comes to greatest eastern elongation on the morning of November 16th. During the greater part of the month it sets at least an hour after sunset, and may be seen in clear weather. It is quite near several of the planets, and there are several interesting conjunctions. It moves away from the Sun until November 16th, passing *Mars* on November 4th, morning, distance 1° 48′, the Moon on November 4th, evening, with an occultation for some places, *Uranus* on November 8th, evening, distance 2° 37′, and as it returns toward the Sun after November 16th, it passes *Venus* on November 26th, morning, distance 0° 43′, and *Mars* again November 30th, evening, distance 0° 23′.

Venus is an evening star, increasing its distance from the Sun,